“Bioprospecting of *Terminalia* Species for their Antioxidant, Antidepressant and Antiarthritic Potential.”

A

Synopsis submitted to

Swami Ramanand Teerth Marathwada university, Nanded.

For the degree of

Doctor of philosophy in Botany

Under the faculty of science

By

Miss. Shubhangi Dilip Tidke

Under the Guidance of

Dr. R. B. Patil

Assistant Professor and Research Guide

Department of Botany,

Indira Gandhi Senior College CIDCO, Nanded.

Dec- 2024.

Bioprospecting of *Terminalia* Species for their Antioxidant, Antidepressant and Antiarthritic Potential.

1. Introduction

Herbal medicines are a vital and rising part of the international pharmacopeia. Knowledge of their medicinal properties is rising as a result of research and testing, that will make them an increasingly safe alternative or a preferred alternative to allopathic medicine. Nowadays, there is a renewed interest in the traditional medicine and a growing demand for more drugs of plant origin. This revival of interest in plant-derived drugs is mostly due to the current widespread belief that **"Green Medicine"** is safe and more dependable than the costly synthetic drugs, several of which possess adverse side effects (Parekh and Chanda 2006).

Potential sources of natural antioxidant, antiarthritic and antidepressant have been searched in different types of plant materials such as vegetables, fruits, leaves, oilseeds, cereal crops, tree barks, roots, spices and herbs (Rababah, Hettiarachy, & Horax, 2004). A number of plants such as rosemary and sage belonging to Labiateae family have provided effective antioxidative extracts, used for the protection of oils, fats and salad dressings (Bandoniene, 2000).

2. Review of Literature and Development in the subject

Shahin et al. (2018) tested effect of extracts of 18 plants against *S. sclerotiorum* causing stem rot of mustard, using poisoned food technique. They found extracts of *Allium cepa, Azadirachta indica, Datura stramonium, Ocimum tenuiflorum, Polyalthia longifolia, Tagetes erecta, Catharanthus roseus, Withania somnifera* and *Allium sativum* almost completely inhibited mycelial growth of fungus. Chanda et al., (2011) reported that treatment with GR isolate of *Trichoderma harzianum* and *Allium sativum* clove extract caused significant increase in seed germination and radicle length of Indian mustard by reducing *Sclerotinia* rot. Tripathi and Tripathi (2009) used different plant extracts Vz. *Allium sativum, Eucalyptus globosus, Azadirachta indica, Ocimum sanctum (O. tenuiflorum), Parthenium hysterophorus, Bougainvillea spectabilis, Lantana camara, Datura stramonium, Calotropis procera* and *Capsicum annum* against *Sclerotinia sclerotiorum* causing stem rot of Indian mustard (*Brassica juncea*). Yadav (2009) tested In Vitro efficacy of five botanicals Viz., *Allium sativum, Allium*

cepa, Eucalyptus globosus, Azadirachta indica, Calotropis procera against *S. sclerotiorum* causing stem rot of Indian mustard. *Allium sativum and Eucalyptus globosus* were more effective than control. Gupta et al. (2010) screened aqueous extract of Jwarhar mahakashay Ayurvedic preparation (from the roots of *Hemidesmus indicus* R. Br., *Rubia cordifolia* L., fruits of *Terminalia chebula Retz., Cissampelos pareira L.; Grewia asiatica L., Emblica officinalis Gaertn., Terminalia bellirica Roxb., Vitis vinifera L., Salvadora persica* L. and granules of *Saccharum officinarum* L.) Flavonoids, glycosides and tannins were later found to be present in the extract. Thin layer chromatography and high-performance liquid chromatography also confirmed the possibility of at least one major and two minor compounds.

Considering the vast potential of plants as a source of antimicrobial agents with regard to antibacterial and antifungal agents, a scientific investigation was administered to screen the plants for antioxidant, antiarthritic and antidepression activity with the subsequent objective.

3. Objectives of present study

The present investigation will be undertaken to evaluate the potential of phytochemicals of *Terminalia* species Leaf, fruit and bark extracts and evaluation of their antioxidant, anti-arthritic and antidepression potential.

The objectives of the proposed work are as follows,

- Collection, identification and authentication of medicinal plants.
- Soxhlet extraction, measurement of crude extracts yield, qualitative and quantitate phytochemical analysis of selected medicinal plants.
- To evaluate the antioxidant and antiarthritic potential of selected *Terminalia* species.
- To evaluate the antidepressants potential of selected *Terminalia* species.
- To evaluate the cytotoxicity (MTT assay) of selected *Terminalia* species.

4. Materials and methods

1 Materials

1.1 Cleaning of Glasswares and Sterilization of Media

1.2 Chemicals

2. Plant Material and Extract Preparation

2.1 Collection of Plant Material

2.2 Surface Sterilization of Plant Material

2.3 Preparation of Plant Extracts

3 Phytochemical Screening

3.1 Determination of extract yield

3.2 Qualitative Phytochemical Screening

3.3 Quantitative phytochemical screening of the extracts

4 *In vitro* Antioxidant Assay

5 In vitro Anti-inflammatory activity.

6 *In vitro* Anti-arthritic Assay

7 Cytotoxicity by MTT (2,5-diphenyl-2H-tetrazolium bromide) Assay

5. Importance of study/ Society application:

International status

Antioxidant activities increase proportionally with the polyphenol content, primarily because of their redox properties (Rasineni et al. 2008). Among the diverse roles of polyphenols, they protect cell constituents against destructive oxidative damage, thus limiting the risk of various degenerative diseases associated with oxidative stress by acting as potent free radical scavengers. The polyphenol antioxidant activity is due to the chemical structure and ability to donate/accept electrons, thereby delocalising the unpaired electron within the aromatic structure(Ross and Kasum 2002). Recent studies showed the antioxidant properties of different extracts of *T. chebula* fruits. In an earlier report, a 70% methanol extract of *T. chebula* fruits was found to have good efficacy in radical scavenging abilities (Hazra et al. 2010). In another report, chloroform,

ethanolic, n-butanolic and organic aqueous extracts were investigated for anti-lipid peroxidation, anti-superoxide radical formation and free radical scavenging activities. The results showed that all tested extracts exhibited antioxidant activity at different magnitudes of potency . Casuarinin, chebulanin, chebulinic acid and 1,6-di-O-galloyl-b-D-glucose, isolated from *T. chebula*, were also tested in this study and showed significant antioxidant activity (Cheng et al. 2003). Chang and Lin 2012 reported antioxidant activities of water, methanol and 95% ethanol extracts of the air-dried fruit of *T. chebula*. However, the antioxidant activity of the polyphenolic-rich extract of *T. chebula* fruit has not been previously evaluated. Therefore, the objective of this study was to assess the free radical scavenging potential of the polyphenolic extract of *T. chebula* fruits.

National Status

Many Indian plants have been employed from time immemorial to treat a variety of diseases and infections in traditional medicinal systems of India for instance Siddha, Ayurveda, Naturopathy, etc. (Shekhawat and Prasad 1971, Khanna and Chandra 1972). The efficacy of the plants in curing various ailments is well established and a large volume of work has been done in this field by researchers in India and abroad. The traditional method of extraction from these Indian plants involves a number of solvents that are used in various cases (Ganesan and Krishnaraju 1995). Although various solvents have been used, doubts still persist regarding the most effective solvent that should be used to extract the active constituents from a given plant in the treatment of a particular disease. Mitra et al. (2000) found antibacterial activity of *Terminalia bellerica* (fruits). *Curcuma longa* (rhizome), *Ocimum sanctum* (leaves) and *Rosa damascene* (petals) against *Escherichia coli* and *Staphylococcus aureus*. Srivastava et al. (2000) reported that the roots of *Terminalia alata* yielded three new glycosides. Out of which two compounds showed antifungal activity. Goud et al. (2002) screened 48 ethanol, acetone and chloroform soxhlet

Significance of the study

Antioxidants study help to prevent oxidative stress, which can damage cells and lead to chronic inflammation and other health issues and may help to protect against depression. However, antioxidants can also be harmful in some cases, such as in people suffering with cancer.

Depression is associated with oxidative stress, mitochondrial dysfunction, and reduced antioxidant effectiveness. Some nutraceuticals, such as probiotics, polyphenols, and carotenoids, may help with depression by changing the gut microbiota. Such herbal medicine help as antidepressant. Anti-arthritic study can help to relieve or prevent joint pain and stiffness. Such herbal medicine may work by reducing inflammation, managing pain, or acting as an immunosuppressant. So the work is undertaken for the study.

Plan of work:

	Parameters
First year	1. Review of literature
	2. Collection of material from different localities.
	3. Preparation of plant extracts for laboratory work.
	4. Phytochemical Tests
Second year	1. *In vitro* Antioxidant Assay
	2. In vitro Anti-inflammatory activity.
	3. Cytotoxicity
Third year	1. In vitro Antiarthritic activity.
	2. Preparation of research papers and articles
	3. Writing and submission of thesis

6. References

Chanda S., Kaneria M. and Vaghasiya K.Y. (2011).Evaluation of antimicrobial potential of some Indian medicinal plants against some pathogenic microbes. Indian J Nat Prod Resour.2:225-8.

Chang C.L., C.S. Lin. Phytochemical composition, antioxidant activity, and neuroprotective effect of Terminalia chebula Retzius extracts Evid. Based Complement. Altern. Med., 2012 (2012), pp. 1-7.

Cheng H., T. Lin, K. Yu, C. Yang, C. Lin.Antioxidant and free radical scavenging activities of *Terminalia chebula*. Biol. Pharm. Bull., 26 (2003), pp. 1331-1335

Ganesan. T. and Krishnaraju. J. C. (1995). Antifungal property of wild plants. Advances in Plant Sciences. 8: 194-196.

Goud, P.S.P., Murthy, K.S.R., Pullaiah, T. and Babu, G.V.A.K. (2002). Screening for antibacterial and antifungal activities of some Medicinal plants of Nallamalaais. Andhra Pradesh, India. J. Econ. Taxonomic Bot., 26(3): 677-684.

Gupta S.S. (1994). Prospects and perspectives of natural plant products in medicine. Indian Journal of Pharmacology. 26:1-12.

Hazra B., R. Sarkar, S. Biswas, N. Mandal. Comparative study of the antioxidant and reactive oxygen species scavenging properties in the extracts of the fruits of *Terminalia chebula, Terminalia belerica* and *Emblica officinalis* BMC Complement. Altern. Med. (10) (2010), p. 20

Khanna. K. K. and Chanrda. S. (1972). Antifungal activity of some plant Proceedings of the National Academy of Sciences of India. 42 (8): 111.

Mitra, S.K., Sundaram, R., Venkataranganna, M.V., Gopumadhavan, S., Prakash, N.S. Jayaram, H.D. and Sarnia, D.N.K. (2000). Anti-inflammatory, antioxidant and antimicrobial activity of Ophthacare Brand, and herbal eye drops. Phytomedicine, 7(2): 123-127

Parekh J. and Chanda S. (2006). In Vitro antimicrobial activities of extracts of *Launaea procumbens* Roxb. (Labiateae), *Vitis vinifera* L. (Vitaceae) and *Cyperesrotundus* L. (Cyperaceae). African Journal of Biomedical Research. 9: 89-93.

Rababah TM, Hettiarachy NS, Horax R (2004) J Agric Food Chem 52:5183–5186 https://doi.org/10.1021/jf049645z; Siddhuraju P, Becker K (2003) J Agric Food Chem .

Rasineni G.K., D. Siddavattam, A.R. Reddy.Free radical quenching activity and polyphenols in three species of Coleus.J. Med. Plants Res., 2 (2008), pp. 285-291

Ross J.A., C.M. Kasum. Dietary flavonoids: bioavailability, metabolic effects, and safety.Ann. Rev. Nutr., 22 (2002), pp. 19-34. View at publisher Crossref View in

Shahin Aziz, Momtahina Ria, Shirin Aktar Banu (2018). Phytochemical Screening, Ultra violet and FT- IR Spectroscopy of Ethanolic Extract of *Terminalia bellirica* Seed. International Journal of Pharmacognosy and Phytochemical Research; 10(12):376-380

Shekhawat. P. S. and Prasad.R. (1971). Antifungal properties of some plant extracts and their inhibition of spore germination. Indian Phytopathology 24. 800-802.

Srivastava, S.K., Srivastava, S.D. and Chouksey, B.K. (2000). New antifungal constituents from *Terminalia alata*. Fitoterapia.72(2):106-112.

Signature
Research scholar

Signature
Research Supervisor